

What is claimed is:

1. A method of frame forwarding in an Ethernet network,
comprising the steps of:

receiving a frame from an input port, said frame
containing a packet;
determining an output port coupled with a destination node
of said packet via a data path;
building a forwarding frame containing said packet;
storing said forwarding frame in an output queue
corresponding to said output port;
combining a plurality of forwarding frames stored in said
output queue into a combined frame; and
transmitting said combined frame to said output port.

2. The method of claim 1, further comprising the steps of:
preparing a routing table, each entry of said routing
table containing a destination address value indicating a
destination node of said packet, a port ID value
indicating said output port, and a forwarding address
value;
extracting a destination address value from said packet
contained in said frame;
looking up said destination address value in said routing
table;
determining said port ID value and said forwarding address
value corresponding to said destination address value;

building a forwarding frame with a header field and a data field, said header field containing said forwarding address value as a destination address, said data field containing said packet; and
storing said forwarding frame into said output queue corresponding to said output port.

3. The method of claim 1, further comprising the steps of:
extracting a plurality of forwarding frames from said output queue,
combining each packet contained in each of said forwarding frames into one combined packet;
building a combined frame containing said combined packet as a data field, said combined frame having a header including a predetermined ID value, said predetermined ID value indicating that said combined frame contains said combined packet; and
transmitting said combined frame to said output port.

4. The method of claim 1, further comprising the steps of:
receiving said combined frame from said input port;
extracting said combined packet from said combined frame;
decomposing said combined packet to original packets;
determining said output port coupled with destination node of each of said original packets via said data path;
building said forwarding frame containing each of said original packets; and

storing said forwarding frame in said output queue
corresponding to said output port.

5. The method of claim 3, further comprising the steps of:
preparing a packet counter in said output queue, said
packet counter indicating a number of packets to be
combined wherein a size of said combined packet does not
exceed the maximum data field size defined in Ethernet;
combining a plurality of packets contained in said
plurality of forwarding frames stored in said output
queue into said combined packet, wherein said plurality
of packets are combined in queuing order and the number
of packets combined is equal to said packet counter.

6. The method of claim 5, wherein said combined packet has
a following data allocation:

- (1) the number of packets to be combined,
- (2) a sequence of size values of original packets, and
- (3) a sequence of original packets,
wherein said sequence of size values of said original
packets are allocated in the same order as said sequence of
said original packets.

7. The method of claim 3, further comprising the steps of:
preparing a timer monitor corresponding to said output
queue, said timer monitor having a timer with a
predetermined expiring time;
activating said timer at a completion of frame

transmission;

suspending composition and transmission of forwarding frames stored in said output queue while said timer is active;
executing composition and transmission of said forwarding frames at expiration of said predetermined expiring time.

8. The method of claim 7, further comprising the steps of:
setting said predetermined expiring time for the minimum time value of the inter-frame gap defined in Ethernet.

9. The method of claim 1, further comprising the steps of:
transmitting to a forwarding node a query frame, said

query frame including a function-query packet for querying whether said forwarding node is available for processing said combined frame;

receiving a response frame from said forwarding node, said response frame including a check-response packet indicating that said forwarding node is available for processing said combined frame; and
determining that said forwarding node is available for processing said combined frame.

10. A method of frame forwarding in an Ethernet network,
comprising the steps of:

forming a plurality of output queues which are including a plurality of frames to be sent from same port,
respectively;

combining said plurality of frames in one of said plurality of output queues into a combined frame; and transmitting said combined frame from a corresponding port.

11. A network switch for frame forwarding in an Ethernet network, comprising:

a frame receiver for receiving a frame from an input port, said frame containing a packet;
a routing means for determining an output port coupled with a destination node of said packet via a data path;
a frame builder for building a forwarding frame containing said packet;
an output queue for storing said forwarding frame, said output queue corresponding to said output port;
a frame composer for combining a plurality of forwarding frames stored in said output queue into a combined frame; and
a frame transmitter for transmitting said combined frame to said output port.

12. A network switch of claim 11, wherein said routing means comprising:

a routing table for recording forwarding information entries, each of said forwarding information entries containing a destination address value indicating a destination node of said packet, a port ID value indicating said output port, and a forwarding address

value indicating a frame forwarding node; and
a routing control for determining said port ID value and
said forwarding address by looking up said destination
address value in said routing table.

13. A network switch of claim 11, wherein said frame
composer extracts said forwarding frames from said output
queue, combines each packet contained in each of said
forwarding frames into a combined packet, and builds said
combined frame containing said combined packet as a data
field, said combined frame having a header including a
predetermined ID value, said predetermined ID value
indicating that said combined frame contains said combined
packet.

14. A network switch of claim 11, further comprising:
a frame decomposer for decomposing said combined packet
contained in said frame received from said input port
to original packets, said original packets being
processed by said routing means.

15. A network switch of claim 13, wherein said output
queue has a packet counter indicating the number of packets
to be combined, and a plurality of packets contained in said
plurality of forwarding frames stored in said output queue
are combined into said combined packet in queuing order
wherein the number of packets combined is equal to said
packet counter, and a size of said combined packet does not

exceed the maximum data field size defined in Ethernet.

16. A network switch of claim 15, wherein said combined packet including: (1) the number of packets to be combined, (2) a sequence of size values of original packets, and (3) a sequence of said original packets wherein said sequence of size values of said original packets are disposed in the same order as said sequence of said original packets.

17. A network switch of claim 11, further comprising:

a timer monitor for controlling composition and transmission of said forwarding frames stored in said output queue, said timer monitor having a timer with a predetermined expiring time, said timer being activated at a completion of frame transmission, said timer monitor suspending composition and transmission of said forwarding frames while said timer is active, said timer monitor executing composition and transmission of said forwarding frames at expiration of said predetermined expiring time.

18. A network switch of claim 17, wherein said predetermined expiring time is set for the minimum time value of the inter-frame gap defined in Ethernet.

19. A network switch of claim 11, further comprising:

a function checker for determining whether a forwarding node is available for processing said combined frame, said function checker transmitting to said forwarding

node a frame including a function-query packet for querying whether said forwarding node is available for processing said combined frame, said function checker receiving from said forwarding node a response frame including a check-response packet indicating that said forwarding node is available for processing said combined frame.

20. A network switch for frame forwarding in an Ethernet network, comprising:

an output queue for storing a plurality of frames to be sent from a port;
means for combining said plurality of frames in said output queue into a combined frame; and
means for transmitting said combined frame from said port.